

OSD CAPE Support to UK Strategic Defense and Security Review (SDSR)

July thru Oct 2010



**Erik Adams
Simulation & Analysis Center
Jan 26, 2011**

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 26 JAN 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE OSD CAPE Support to UK Strategic Defense and Security Review (SDSR). July thru Oct 2010				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Department of Defense,Simulation & Analysis Center,Washington,DC,20301				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 2011 Force Structure Workshop, TASC Heritage Conference Center, Chantilly, VA, 24-27 January 2011					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 21	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Purpose/Agenda

OSD

- **Purpose:**
 - Provide an overview of analysis in support of the UK SDSR
 - Describe US support to the SDSR
 - Discuss insights from this effort that could shape US analysis
- **Agenda:**
 - Background
 - SDSR Analysis
 - Insights

Background

OSD

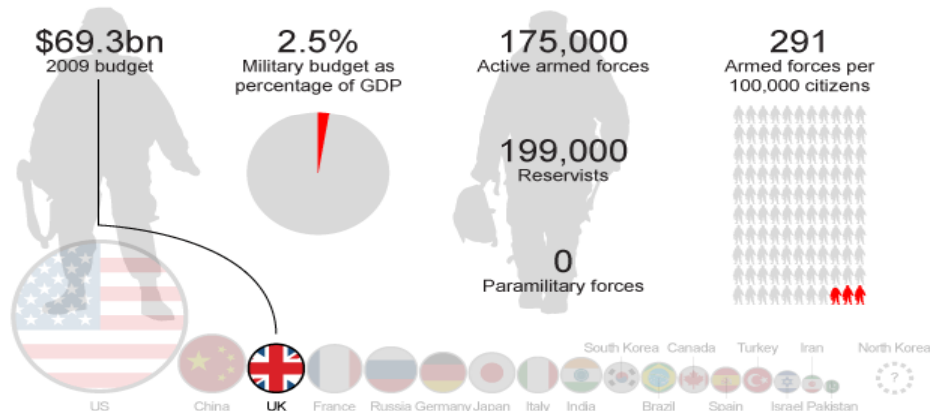
- May, 2010 UK election brought a new government to power; the Conservative Party in coalition with Liberal Democrats announced plans for a 20% across-the-board cuts to government spending and launched the SDSR
 - UK government debt is 64% of GDP (£: 927B)
 - Budget deficit 13% of GDP
- New government directed the development of options to reduce the Defense Budget by up to 20% accounting for:
 - Modernization costs
 - Personnel costs increasing above the rate of inflation
 - Replacing the UK nuclear deterrent
- Future Character of Conflict (FCOC) strategy paper provided future operational context
- US supported SDSR in multiple UK organizations
 - Jim Johnson (OSD/CAPE) – Equipment Programming
 - Rachel Ellehaus (OSD (P)) – Strategy Development
 - Al Sweetser (OSD/CAPE/SAC) – Strategy Management/Operational Analysis
 - Erik Adams (OSD/CAPE/SAC) – Strategy Management/Operational Analysis
 - LtCol Nestor Perone (USAF) – exchange officer to RAF

UK Defense Overview

OSD

UK military spending

The UK is the world's third largest spender on its military, and has the second largest military in the EU.



ROYAL NAVY

>> Total number of personnel

35,650

>> Power projection

	2	Aircraft Carriers (+1 reserve)
	1	Assault Ship
	2	Landing platform dock
	6	Destroyers
	17	Frigates

>> Royal Marines Command

6,840 Royal Marines (excluding Army elements)

>> Submarines

	4	Vanguard class (armed with Trident missiles)
	1	Swiftsure Class
	6	Trafalgar Class

>> Patrol, survey and trainer ships

	1	Antarctic Patrol Ship
	4	River Class Patrol Vessels
	1	Ocean Survey Vessel
	2	Coastal Survey Vessels
	2	Multi-Role Survey Vessels
	16	Minehunters
	16	Fast Training Boats
	2	Fast Patrol Boats

BRITISH ARMY

>> Total number of personnel

100,290

>> Combat Units

- 5 armoured regiments
- 5 armoured recon. regiments
- 6 field artillery regiments
- 3 air defence regiments
- 9 armoured infantry battalions
- 3 mechanised infantry battalions
- 20 light infantry battalions
- 2 paratroop battalions
- 2 air assault battalions
- 4 aviation regiments (helicopter)

These combat units are supported by engineer, signal, maintenance and logistic units

>> Special Forces

- 1 regular SAS regiment
- 1 special forces support group
- 1 reconnaissance and surveillance regiment
- 1 signal regiment

>> Equipment includes

	386	Challenger 2 main battle tanks
	475	Reconnaissance vehicles
	575	Warrior armoured infantry fighting vehicles
	2,718	Armoured personnel carriers
	877	Artillery pieces

ROYAL AIR FORCE

>> Total number of personnel

39,750

329 Combat

	75	Harrier GR7/7A, GR9/9A
	53	Tornado F3
	137	Tornado GR4/A
	64	Eurofighter Typhoon

20 Recon and patrol

	5	Boeing Sentry
	5	Raytheon Sentinel
	4	Beechcraft Shadow
	2	Nimrod
	2	Diamond DA42 Twin Star
	2	General Atomics MQ-9 Reaper

79 Tanker & transport

	24	Hercules C4/C5
	14	Hercules C1/C3
	15	Vickers VC-10
	9	Tristar
	6	Globemaster C-17A
	6	BAe 125
	3	Britten-Norman Islander
	2	BAe 146

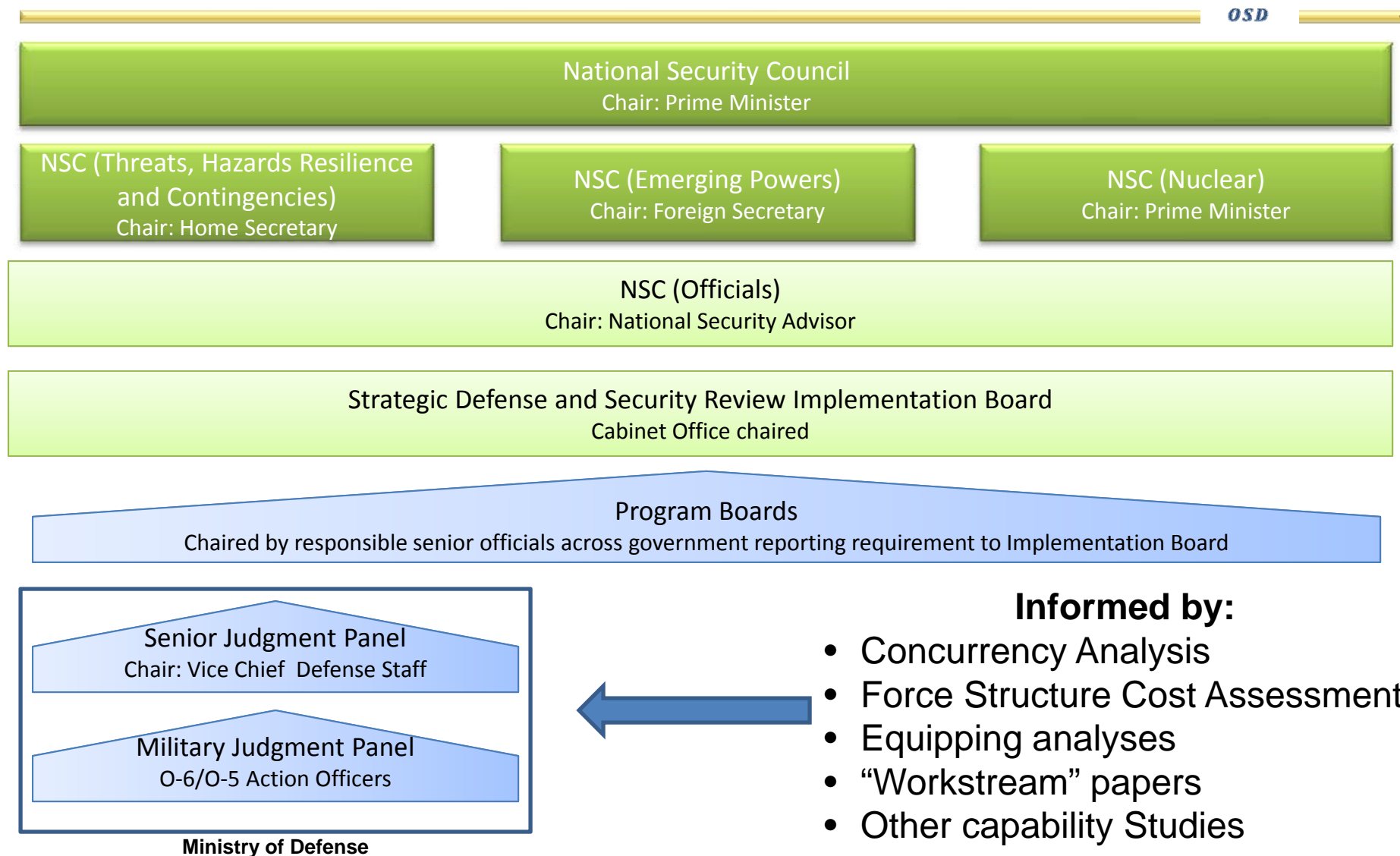
151 Helicopters

	48	Chinook
	43	Puma
	28	Merlin
	25	Sea King
	4	Griffin
	3	Agusta A109E

533 Trainer aircraft

SDSR analysis 181 Force Elements that addressed ~67% of Defense Budget & ~50% of Manpower

SDSR Organization



Scenarios and Force Sizing Construct

OSD

Strategic Postures Evaluated

Committed Britain

Committed, Large Stabilization,
and a simple operation

Adaptable Britain

Committed, Medium
Stabilization, and two small
complex, and a simple operation

Vigilant Britain

Committed, Small Stabilization,
medium complex, and a simple
operation

* Presented is initial Force Sizing Construct. SDSR ended up focusing on Adaptable and eliminating one complex scenario

- Scenarios binned into 4 classifications
 - **Committed** - Homeland Defense, nuclear deterrence, special operations, strategic intelligence
 - **Stabilization** – enduring operations
 - **Complex** – multi-service focus and multiple objectives
 - **Simple** – single-service focus and singular objective
- The force sizing construct evaluated seven scenarios
 - Restore freedom of navigation in contested waters ([ability to sustain global trade](#))
 - Stabilization ([scale and sufficiency in ability to deploy and sustain a brigade size force including enablers](#))
 - UK lead Coalition that intervenes in civil war with follow-on counter-insurgency ([logistics and C2 capabilities](#))
 - Reaction to loose nuke in hands of non-state group ([highly responsive force with focus on strategic intelligence](#))
 - Complex NEO ([rapid deployment and reach-back](#))
 - Liberation of allied from occupying state ([multi-role brigade with maritime and air support](#))
 - Deter Use of Force against UK ([presence and nuclear deterrent](#))

Competing Contributions to SDSR Analysis

OSD

- Equipment Programming Division
 - Equipping issue analyses
 - Approach: Strategic Balance of Investment (StratBol) model
- Strategy Management Division
 - Operational Analysis
 - Approach: Concurrency Analysis Tool (CAT), supported by DSTL
- Strategy Development and MoD Programmers
 - Cost Analysis
 - Approach: “Workstreams” papers

All strands of analysis considered Force Sizing Construct, Concurrency, and Costs

SDSR General Methodology & Process

OSD

- National Security Council established force sizing construct
- Senior Judgment Panel (SJP: Vice Chief led) and Military Judgment Panel (MJP: O-5/O-6 action officers) reviewed and approved scenario demands
- MoD programmers computed cost for various options generated by 30 teams covering a range of capabilities
- MoD organizations (FD/OA/EP/DSTL - Military and Analysts) conducted concurrency analysis using StratBol, Concurrency Analysis Tool, and Force Costing Tools
 - Developed Force structure options based on Senior leadership guidance, scenario requirements, and cost constraints
 - Conducted *Sufficiency Analysis* for each of the force structure options to determine a potential force structure's ability to support a force sizing construct and test its robustness against more demanding and complex scenarios
- Analytical products were considered in the SJP and NSC to inform decisions

Concurrency Analysis

OSD

Adaptable Britain

Committed, Medium Stabilization, and two small complex, and a simple operation

1. Standing Commitments
2. Medium Stabilization
3. 1st Complex
4. 2nd Complex
5. Simple

33 Total Scenario Combinations

Complex Scenarios

- Scenario X
 - COA 1
 - COA 2
- Scenario Y
 - COA 1
- Scenario Z
 - COA 1
 - COA 2
 - COA 3

Simple Scenario

- Scenario A
 - COA 1
 - COA 2
 - COA 3

- Based on Strategic Posture and scenario selection all possible permutations are generated
- Sufficiency Analysis is conducted for each Concurrency Set
- Select “most efficient” COA within each Concurrency Set
- Maximum demand based on “most efficient” COA in each of the Concurrency Sets is used to determine over/under utilized forces
 - Each Concurrency Set has multiple scenarios each with multiple Courses of Action
 - The combination of COAs that best aligns with the capability and capacity of a force structure option is selected
 - Other COAs provide a means to test a force structure option to better understand risk and robustness

Concurrent Set with Complex X&Y

Scenario Combination 1

1. Commitments
2. Medium Stabilization
3. Scenario X COA 1
4. Scenario Y COA 1
5. Scenario A COA 1

Scenario Combination 6

1. Commitments
2. Medium Stabilization
3. Scenario X COA 2
4. Scenario Y COA 1
5. Scenario A COA 3



Determine
“most efficient”
COA

Concurrent Set with Complex X&Z

Scenario Combination 1

1. Commitments
2. Medium Stabilization
3. Scenario X COA 1
4. Scenario Z COA 1
5. Scenario A COA 1

Scenario Combination 18

1. Commitments
2. Medium Stabilization
3. Scenario X COA 2
4. Scenario Z COA 3
5. Scenario A COA 3



Determine
“most efficient”
COA

Concurrent Set with Complex Y&Z

Scenario Combination 1

1. Commitments
2. Medium Stabilization
3. Scenario Y COA 1
4. Scenario Z COA 1
5. Scenario A COA 1

Scenario Combination 9

1. Commitments
2. Medium Stabilization
3. Scenario Y COA 1
4. Scenario Z COA 3
5. Scenario A COA 3



Determine
“most efficient”
COA

Max demand of “most efficient” COAs across all Concurrency Sets

Force Structure Tools - Concurrency Analysis Tool (CAT)

OSD

- Determines the “most efficient” course of action for each scenario combination based on weighted score or cost
- Determines the minimal force requirement to achieve all scenario combinations being considered
- Highlights affluences and shortfalls across all COAs given minimal force requirement
- Identifies alternative courses of action that can be met given the minimal force requirement
- Provides recommendations on potential force adjustments given budgetary constraints
- Requires interaction with analyst to determine appropriate substitutions and places to take risk

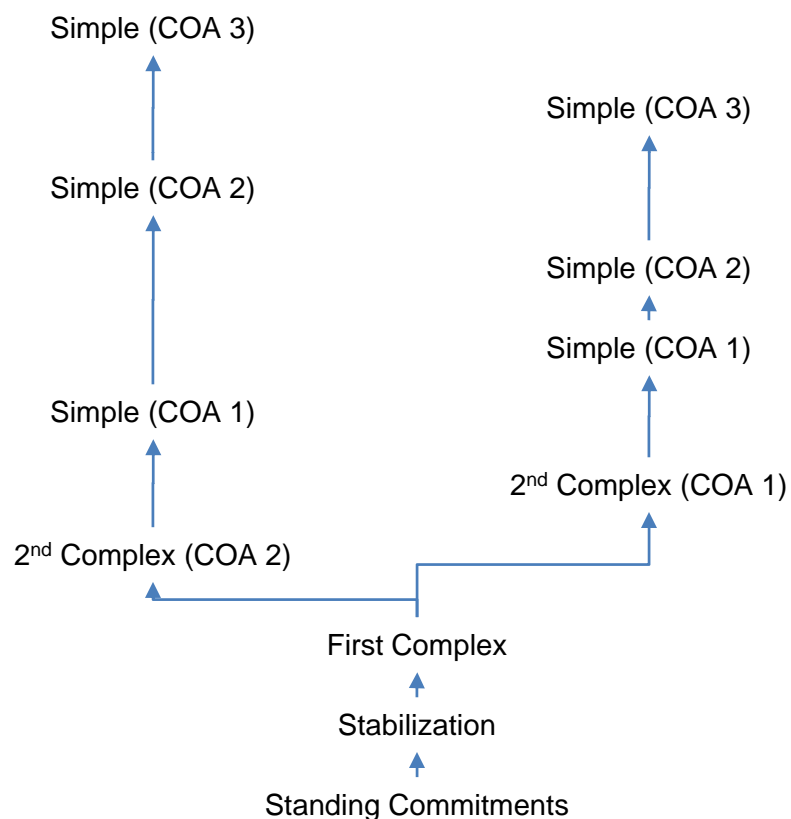
Force Structure Tools – CAT

UNCLASSIFIED

Illustrative Outputs

Represents force utilization for a scenario combination measured against a force structure option

OSD



Medical	Engineers	ISR	Logistics	Helios	BCT	Fast Jets	Carrier/Amhib	MCMV	SOF
Green	Green	Red	Red	Red	Green	Red	Red	Red	Red
Green	Green	Red	Yellow	Red	Green	Red	Red	Red	Red
Green	Green	Red	Yellow	Yellow	Green	Red	Yellow	Red	Red
Green	Green	Red	Yellow	Yellow	Green	Yellow	Yellow	Red	Red
Green	Green	Red	Yellow	Yellow	Green	Yellow	Yellow	Red	Red
Green	Green	Red	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Red
Green	Green	Red	Green	Green	Blue	Blue	Blue	Green	Yellow
Green	Green	Red	Green	Green	Blue	Blue	Blue	Blue	Yellow
Blue	Blue	Yellow	Green	Green	Blue	Blue	Blue	Blue	Green
Blue	Blue	Blue	Blue	Blue	Blue	Blue	Green	Blue	Green

Illustrative Example of output presented to SJP

UNCLASSIFIED

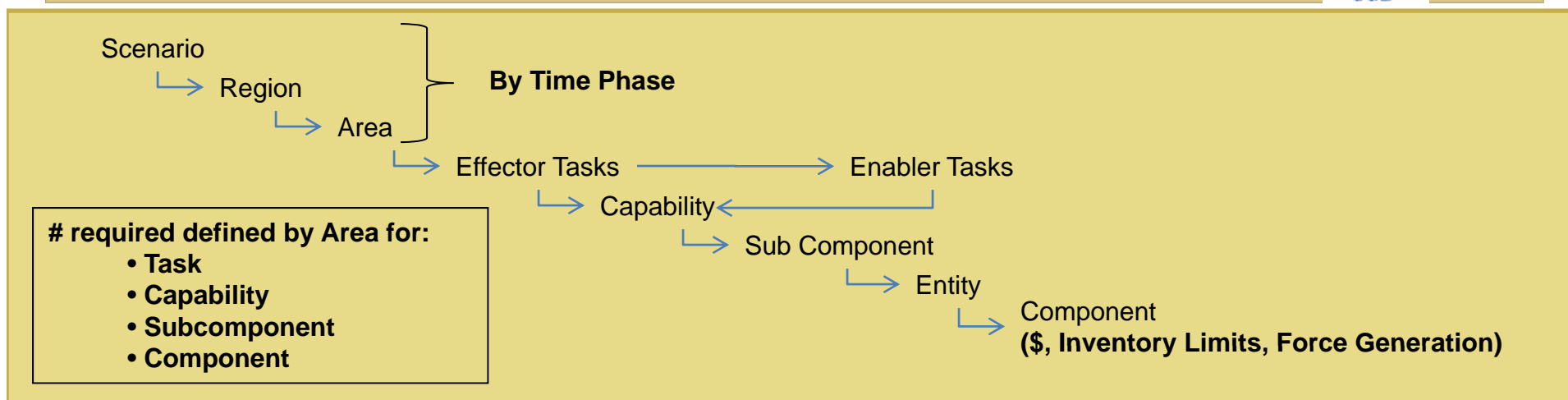
Force Structure Tools - StratBol

OSD

- Optimization tool that determines the most cost effective force structure for each service that best achieves a set of policy goals
- Highlights priorities for savings and areas for investment
 - Determines under-utilized forces and costs associated with not using them
 - Determines over-utilized forces and costs needed to obtain more capability
- Task-based model utilizing **alternative means of achievement** and costs
- SDSR use:
 - Build up of scenarios to better understand operational risks and costs
 - Vary Coalition contributions
 - Modify standing commitments
 - Alter assumptions on level of effort in Afghanistan
 - Vary force structure mix assumptions (decreasing/increasing capabilities)
 - Modify force rotation rates

UK Optimization Tool Structure (StratBol)

OSD



Scenario 1
Region Y
Area X

Battlefield
Hard/Complex/
No SAM Threat

Air-to-
Ground

Dependent Enablers

Air Defense
Escort
Lo UCAV
StealthCap

Independent Enablers include:

- Lift
- Protection
- Fuel
- Maintenance
- Logistics
- Movement

Estimate of UK Variable Sizes

	Large	Medium	Small	Stabilization
Effector Tasks	200	100	30	50
Regions	4 - 5	2 - 4	1	1
Areas (per region)	4 - 5	1 - 3	1 - 2	1
Capabilities	175			
Sub Components	250			
Entities	250			
Components	150			

F-16_Scen1 or
A-10_Scen1 or
F-15E_Scen1

F-16_Entity

F-16 Block 40 and
ISR Aircraft Support and
AAR Aircraft and
C2 Support

SDSR Key Outcomes

OSD

- 8% reduction in defense spending
- 17K personnel reduction across Army, Navy, AF
- 30% cut in MOD civilian workforce
- Cuts Nimrod, Ark Royal Aircraft Carrier, Sentinel, 600 tanks and armored vehicles, 4 destroyers/fast frigates, 5 Army HQ
- Early retirement of Tornado and Harrier
- Cancels buy of 138 F-35B and replaces with smaller buy of F35C
- Cuts 1 Army Brigade
- Buys more Transport/Utility Helios (Chinooks, extends Puma, upgrades Merlin, continues Wildcat buy)
- Delayed Trident nuclear deterrent replacement by up to 5 years
- No cuts to SF and Marines
- Invests in Cyber
- Places new aircraft carrier, amphibious ship, some tanks and aircraft in extended readiness for regeneration

Strengths & Weaknesses of SDSR Analysis

OSD

Strengths

- Credibility of scenarios was improved by FCOC and SJP/MJP
- SJP/MJP provided responsive guidance
- Analysis turn around was rapid and relevant
- A wide range of alternatives was considered

Weaknesses

- Did not consider future shocks or scenarios beyond those initially prescribed
- Did not consider linkages to future concepts
- Simplified Force Management Assumptions
- Although depth of scenarios was a strength, the breadth of scenarios considered could have been expanded

US/UK Analysis Comparison

OSD

	US	UK
Players	<ul style="list-style-type: none"> • OSD (P), OSD CAPE, Joint Staff, Military • Stove-Piped with Structured Collaboration 	<ul style="list-style-type: none"> • Policy, Programmers, Operational Analysis, Military • Integrated no independent analysis
Scenarios	<ul style="list-style-type: none"> • Day-to-Day, CM, and Stabilization, Warfighting • Singular means of execution 	<ul style="list-style-type: none"> • Standing Commitments, Stabilization, Interventions • Multiple Courses of Action
Timeframe	<ul style="list-style-type: none"> • Steady State (Rot), Surge (Non-Rot), Post Surge (Rot) 	<ul style="list-style-type: none"> • Single Timeframe (Rot)
Variables	<ul style="list-style-type: none"> • Rotation Rates by Timeframe, RIP/TOA, Presence Usage, Ramp Down of Forces, Disengagement, Mobilization, Force Availability 	<ul style="list-style-type: none"> • Rotation Rates by Event • Costs
Outputs	<ul style="list-style-type: none"> • Over/Under Stressed Capabilities across multiple force sizing constructs 	<ul style="list-style-type: none"> • Over/Under Stressed Capabilities across multiple force structure options and force sizing constructs

Things for DoD to Consider in Future Studies

OSD

- Improve ability to rapidly develop and assess new scenarios
- Improve links in analysis to costs and end strength
- Focus Analytic Agenda work to prepare for future strategic reviews (e.g. QDR, OA etc)
- Consider force testing across a wider range of scenarios and courses of action for each scenario
- Consider impacts of future shocks on defense planning
- Improve participation of allies and consideration of their capabilities

Back up



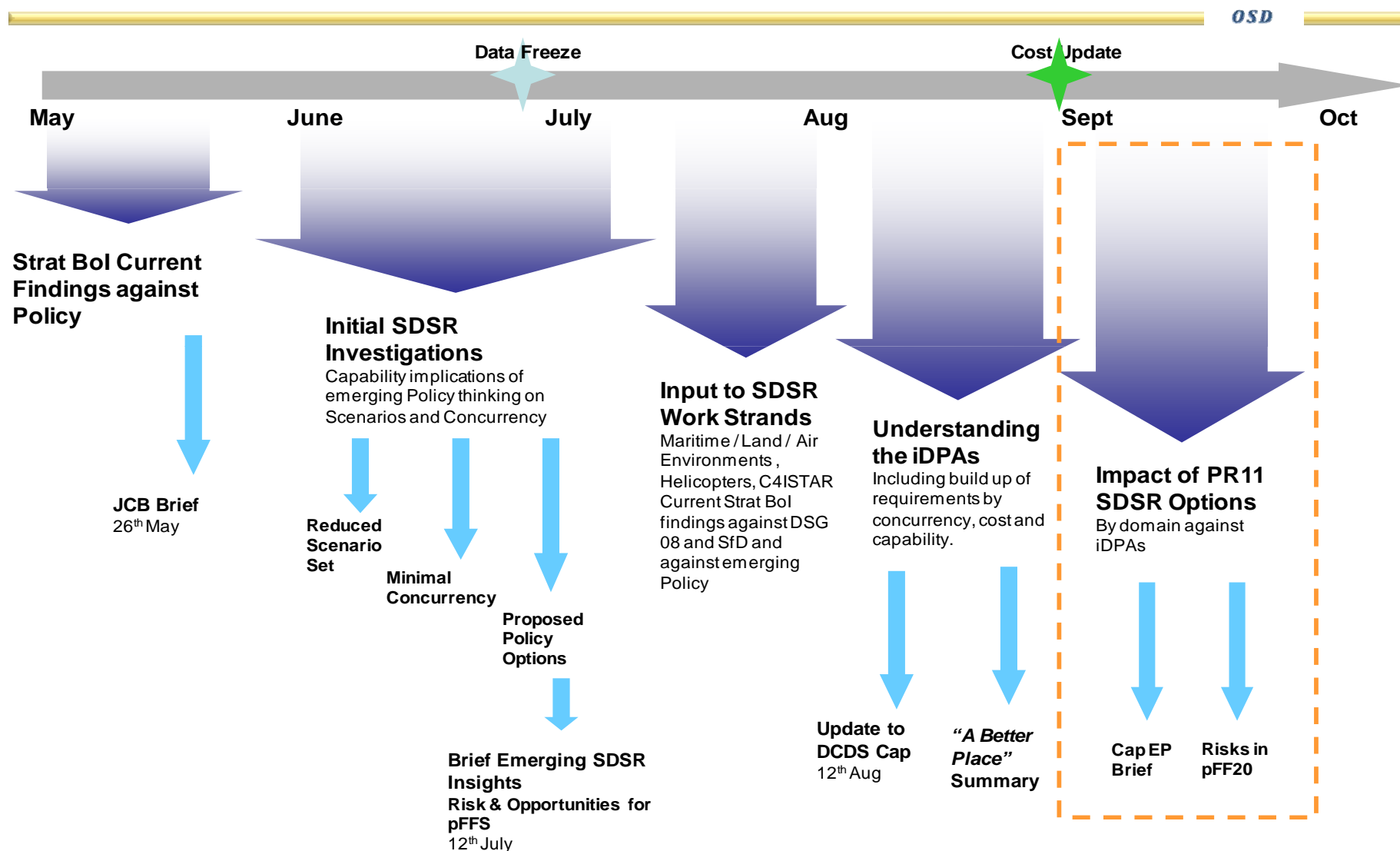
Challenges in the Use of Optimization Tools for Force Structure Analysis

UNCLASSIFIED

OSD

- Task translation
 - Defining number of units to complete task
 - Defining effectiveness functions (linear or non-linear)
- Issues
 - Defining meaningful tasks at an aggregated level
 - Defining alternative capabilities
- Simplification
 - Analytical assumptions
 - Presence Usage, Guard/Reserve Mobilization, Rotational/Non-Rotational forces for same events, etc
 - Data Specification
- Development of cost data
- Policy

Force Structure Tools - StratBol



StratBol provided useful information throughout SDSR process, though it is unclear of how much influence the model results had on Senior decision making

CAPE/SAC Way Ahead

 OSD 

- Plan to integrate Cost and End-Strength into current force structure analysis
- Investigating applicability of optimization
 - Bill Cotsworth on contract thru April 2011
- Work with CAPE/SAC campaign analysts to define Warfight tasks and alternative means of execution
 - Start with ISC B warfights
- Expand on IDA work to determine better estimate cost
- Use IDA COST model to calculate cost of Foundational Activities